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Figure 1. Brookline High School Biology Laboratory, a workshop for student project activities.

Biology Nights

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How many times have you had students ask you in class whether it will be possible to study and discuss further certain phases of biology in which they are especially interested. Have you not had girls, planning on entering the nursing profession, ask if more time can not be devoted to the unit on human anatomy? What about the boy or girl who has a hobby of a biological nature and would like to explain his or her work before the class?

Figure 2. Visitors inspecting the exhibits.

Our biology courses given in secondary schools are required partly because of college entrance examinations (which only a minority of students actually take) and cover so much subject matter in such a short space of time that it seems impossible to find time to satisfy the individual interests of our students.

Scientists are constantly reminding us that something should be done to search for and encourage future scientists in our secondary schools. One answer seems to be through student project work followed by an exhibit before the public, which we call in Brookline "Biology Nights."

I first started this interesting and worth-while activity ten years ago. After investigating and writing about a project which greatly interested them, the students presented exhibits of their research in the laboratory before their parents. It proved so successful that the following two years they conducted the exhibition in a small auditorium. The past seven years, my students have made and gathered so much exhibit material concerning their projects, and their parents, science educators, and the public in general have become so interested in their work, we found it necessary to move into our gymnasium which is 100 feet long and 60 feet wide. "Biology Nights" on June first and second, 1947, attracted a total of 5,462 people, including many outstanding scientists and educators.

Project work begins the first week in October. A list of approximately 200 projects is placed on the clipping board in the laboratory. I have included in this article a list of some of the most popplar projects my students have selected over a period of years. The boys and girls are given all the freedom possible in selecting their project, either from my list or their own choosing. Students I had in the past have added many new projects to my original list.

I stress three points in advising them on their selection. First: Are you extremely interested in your project? It is my opinion that there is no learning without interest. Second: Can your project start you in a hobby or can it further a hobby already begun? Examples of this type of project would be *Nature Photography, New England Butterflies, A Study of New England Trees, Fish and Fishing, New England Song Birds,* and *A Study of Marine Life.* Third: Can your project aid you in your planned life's work? Projects which are popular in this group would be *The History of Nursing, Laboratory Technician Work, United States Forest Service, The Study of Teeth, Study of the Human Eye,* and *A Study of Human Skin and Cosmetics.*

Each student is given two weeks to investigate his project. If he decides upon investigation that the project does not interest him as he at first thought it would, he is allowed to select another project. Everything is done to make

him feel free and independent, both in selection of his project and the research which follows. It is my opinion that youth of high school age should be given more opportunity to work out their own problems. After the student is certain he wants to continue with the project selected, he starts his investigation. We make certain that each student understands and follows the scientific method of approach. He has stated his problem and now he starts collecting facts. He does not limit himself to our school and local libraries, but seeks books and other references from the Boston Public Library and from libraries in near-by colleges. He sends out letters to authorities in his field seeking information. He arranges to make interviews with specialists in his field such as professors, doctors, and plant technicians. Most of our students make at least four interviews. Is not this a worth-while experience for our young people?

After gathering all the information they can through reading material, interviews, and personal experiments, students are now ready to write their reports. We stress quality, and not quantity, yet some of the reports contain more than 10,000 words. Some students think so much of their reports that they have them professionally bound.

After completing their reports, the students start gathering material and making exhibits for the "Biology Nights" exhibition. They set their exhibits up on a Sunday in our gymnasium so that the exhibit may be open to the public the following Monday and Tuesday nights. Each student furnishes his own card table and in case the exhibit is a heavy one, he builds it up from the floor. The use of the card tables, all of which measure about the same, simplifies the laying out of the exhibition hall. We allow parents to bring in the exhibits but they are not allowed to help set them up. Should we not do all we can to encourage parents to take an interest in the school activities of their boys and girls?

Our Biology Club sponsors "Biology Nights." Each member acts as a counsellor for about five exhibitors. The counsellor helps them in such regards as the location of their tables during the exhibit, loans of material from our laboratory, transportation of material to the exhibit hall, and in some cases aids them in seeking advice on the proposed exhibit. It is surprising how much work my club members can get the students to do. In some cases the students will do much more for one of their own age than they will for a teacher. The club sends out the invitations to attend "Biology Nights" to schools, colleges and other leaders in our field. They arrange the entire program, which includes speakers and special biological motion pictures. Last year we were privileged to have Dr. Harlow Shapley, of Harvard University and past president of the A.A.A.S., address us and present the awards.

Figure 3. Admiring the Orchid Exhibit.

I would like to stress the importance of having the students at their exhibit tables explain their projects to the visitors. It is my opinion, that this opportunity

Figure 4. A Nature Photography Exhibit.

my students have of talking with many people and explaining their projects instills a confidence in themselves that is most valuable in their training for later life. Many parents have told me how much that experience has done for their sons and daughters to overcome a lack of confidence in themselves. I have served as judge in science fairs where the exhibitors are not required to be present. It seems to me that a most valuable outcome of an exhibit of this nature was missed.

The exhibits are judged by ten biology teachers, five from the college level and five from the high school level. We give prizes to the ten best exhibitors. There are 10 points considered, yet the two most important are "Has the student a good knowledge of the subject," and "Did he originate and construct his own exhibit?" since doing is learning. The awards are made on the second evening of "Biology Nights." One of the greatest thrills I get from this activity is to witness the enthusiasm written all over the faces of these young people as they anxiously await the decision of the judges.

The attendance at "Biology Nights" has been growing each year. Last spring, as stated before, our attendance was 5,462 people during the two evenings. One hundred and ten students set up 330 table spaces of exhibit material which completely filled the gymnasium. We have biology teachers with their students visit us from schools a considerable distance away. I have found that this activity gives the parents and general public a clearer understanding of the broad scope of our field, and a greater desire among our freshmen to take biology in their sophomore year. I have tried to point out a few of the benefits to our students in undertaking a project and exhibiting before the public; the reader will think of many other worthwhile benefits. One of my greatest pleasures comes from working with these young people after the formal class period is over, when I really learn to know them and to understand their many problems.

Many teachers have asked me how much time this activity takes from the regular class work. Each student is, from time to time, provided with mimeographed copies of instructions. Since all individual instruction takes place after school hours, my regular class work is not interfered with. Naturally, about two days before "Biology Nights" there will be a few instructions that will have to be emphasized.

I have included a series of pictures taken at "Biology Nights" which will give a general idea of the exhibit. I feel I am fortunate in teaching in a school where the Superintendent of Schools, Headmaster, and Head of the Science Department fully appreciate the value of this learning activity to our boys and girls and support me to the fullest extent.

Science teachers in this vicinity are pleased that our local Academy of Arts and Sciences, realizing the need of doing all we can to train scientists for the future, is conducting a New England Science Fair for the first time this spring. The prize winners of four regional New England Science Fairs will exhibit at this final exhibition.

Our "Biology Nights" will come this year on May tenth and eleventh in the Brookline Municipal Gymnasium. We invite all to attend for we feel certain you will benefit by attending and will be amazed what these young people can do in our field if interested, encouraged, and properly guided.

Please feel free to write concerning any questions you might have to ask one who has had ten years of fun conducting "Biology Nights."

LIST OF POPULAR BIOLOGY PROJECTS

PLANT KINGDOM

1—New England Wild Flowers
2—New England Evergreens
3—Soilless Gardening
4—National Parks
5—Christmas Greens and Decorations
6—Lawns and Their Care
7—Taxonomy of Flowering Plants
8—Study of Orchids
9—Plant Breeding
10—A Model Rock Garden
11—Greenhouses
12—Study of Flowers
13—A Model Vivarium
14—Study of Commonly Used Herbs
15—Study of Pollen Grains
16—Collection of Weeds
17—A Study of Mosses and Ferns
18—Desert Terraria
19—U. S. Forest Service
20—Plants for the Home
21—A Study of Cacti
22—Marine Plants
23—A Study of Rubber
24—A Study of Coffee and Tea
25—The Study of Cotton
26—The Study of Medicinal Herbs
27—The Study of Insect-eating Plants
28—A Study of Mushrooms
29—A Study of Germination
30—Bacteriology

ANIMAL KINGDOM

1—Fur-bearing Animals
2—Bird Houses and Feeding Devices
3—Edible Molluscs
4—A Collection of Birds Eggs
5—New England Song Birds
6—Tropical Fish
7—Study of Horses
8—Study of Poultry
9—Study of Amphibians
10—New England Snakes
11—A Study of Pond Insects
12—Household Pests
13—The Conservation of Birds
14—New England Butterflies
15—Fish and Fishing
16—Study of Water Birds
17—Fresh Water Biology
18—Insect Collecting at Night
19—Study of Worms
20—Marine Life
21—Wild Life Conservation in New England
22—The Study of Shells

HUMAN ANATOMY AND DISEASES

1—Effect of Athletic Sports on the Human Body
2—Study of the Nose, Mouth and Throat
3—Tobacco and Its Effects on the Human Body
4—Effects of Alcohol on the Human Body
5—Study of the Human Stomach
6—The Effect of High Altitude Flying on Man
7—The Human Ear
8—The Human Eye
9—The Human Heart
10—Study of the Common Cold
11—Study of Heredity
12—Study of Blood and Circulatory System of Man
13—Dermatology
14—Study of Hair and Nails
15—The Human Skeleton
16—Study of the Brain
17—Study of Malaria
18—Infantile Paralysis
19—Study of Teeth
20—Conquest of Disease
21—The Evolution of Man
22—Study of the Respiratory System

MISCELLANEOUS

1—Study of Foods
2—A Study of Skin and Cosmetics
3—Study of Vitamins
4—Study of the Microscope and Its Work
5—Makers of Biology
6—Our Water Supply
7—History of Surgery
8—The Sulfa Drugs and Penicillin
9—The Story of Milk
10—The Story of Cheese
11—Exploring a Sea Beach at Ebb Tide
12—Boy Scout Merit Badge Work
13—The Study of Bees
14—Art in Relation to Biology
15—Nature Photography
16—Laboratory Techniques

A TEN-YEAR CUMULATIVE INDEX? Thus far only three readers have responded to the request for opinions on this subject. All three were strongly in favor, but three out of almost 2000 members does not constitute a representative group. Unless there is a definite desire for the index, the labor necessary to compile it will not be justified.

If you think the project worth while, be sure to write the editor about it in the near future, because plans for the index if there is to be one, must be laid soon. To be of greatest value the index should appear immediately after the close of the tenth volume, which ends with the *December 1948* issue.

An Introduction to the Identification of Plants

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Objectives:

1. To learn to identify some of the plants in the immediate surroundings.
2. To learn about landscape design by observing the school yard.
3. To learn the uses of certain trees and shrubs.
4. To practice landscape design on a small scale.

Time: Approximately one week.

Concepts:

1. Everyone needs to learn to identify certain plants and certain animals. Ask the students to try and think of a person who does not need this knowledge. Even the city dweller must be able to recognize dogs, cats, mice, and certain vegetables and fruits with which he comes in contact, just as the other extreme, a savage or hermit who lives closer to nature does.
2. In order for plants and animals to be identified they must be organized into groups with similar characteristics. Ask the students to name some of the animal groups—fish, snakes, protozoa, insects. Ask them to name plant groups—trees, shrubs, vines, bacteria.
3. Each plant and animal has one scientific or Latin name and may have several English or common names.
4. Latin is used for scientific naming because:
   (a) It is a finished language and therefore the words do not change in meaning. Ask the students to think of examples of words whose meanings are changing with use today.
   (b) It is a universal language used for all scientific naming all over the world and therefore scientists need to learn only one other language (Latin) besides their own.